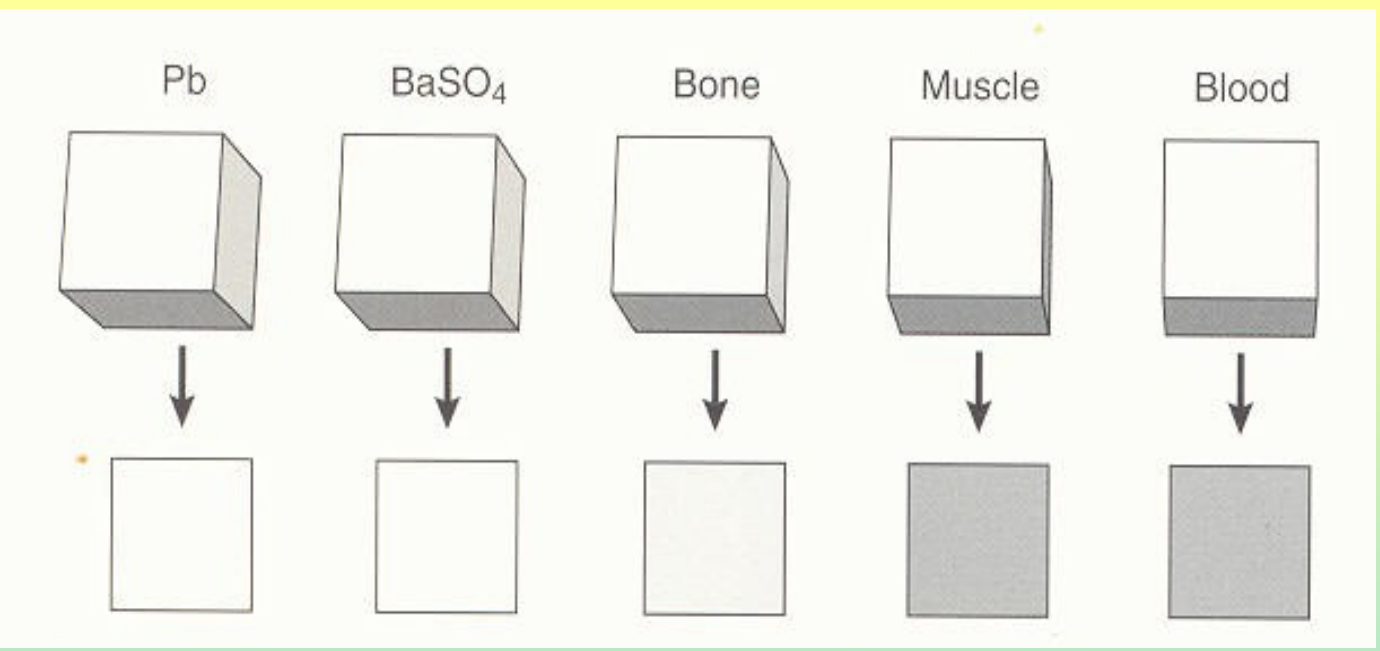
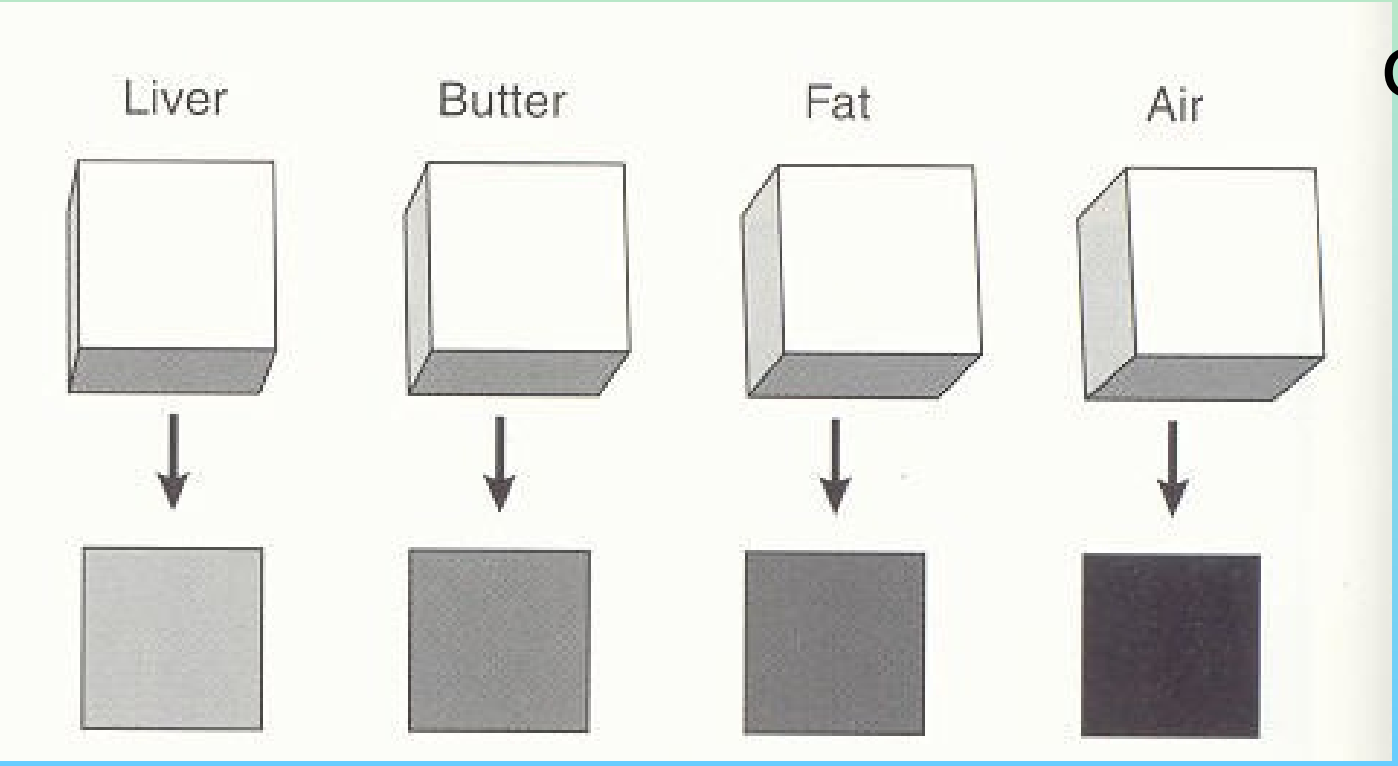
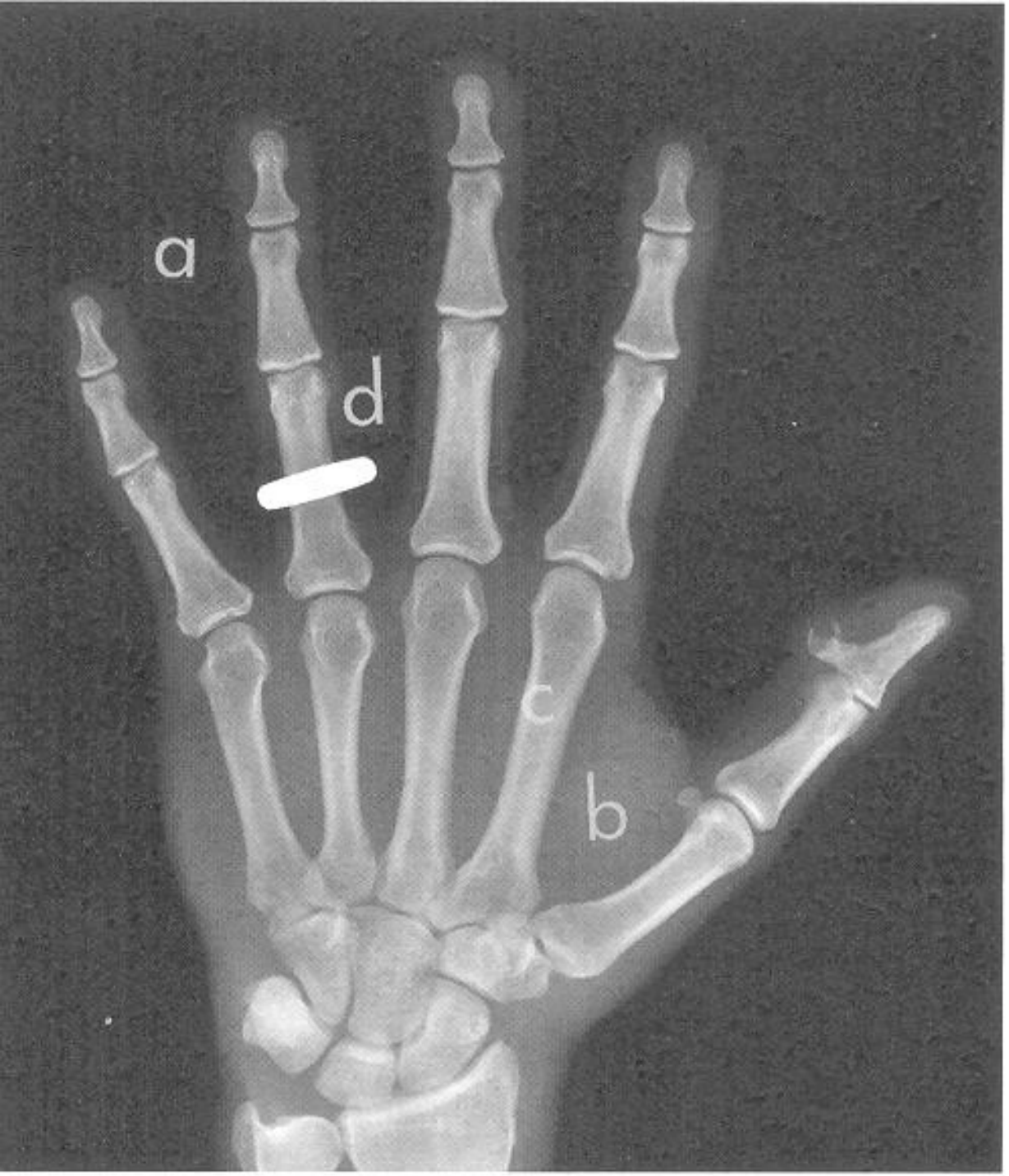
Intro to Radiology

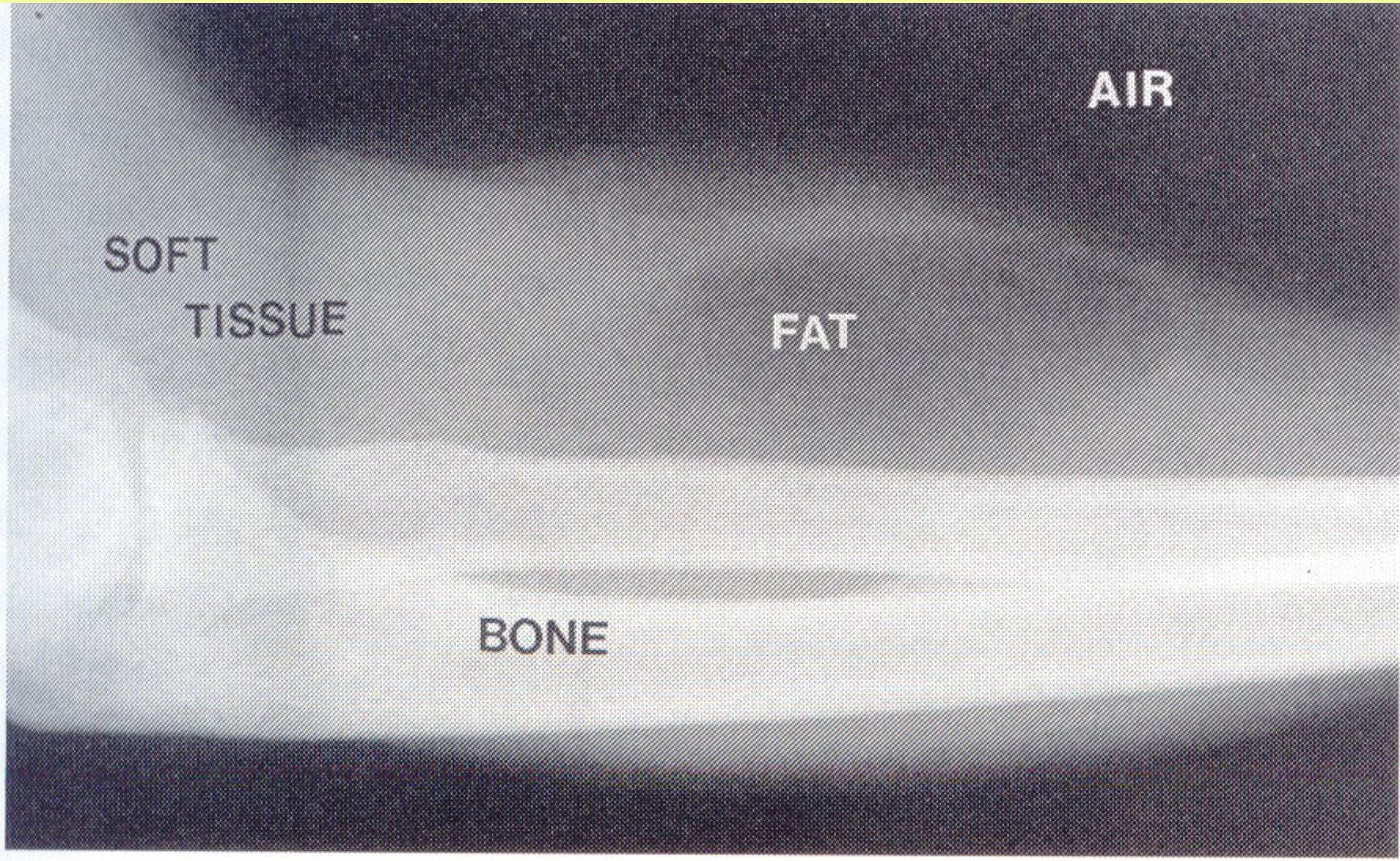




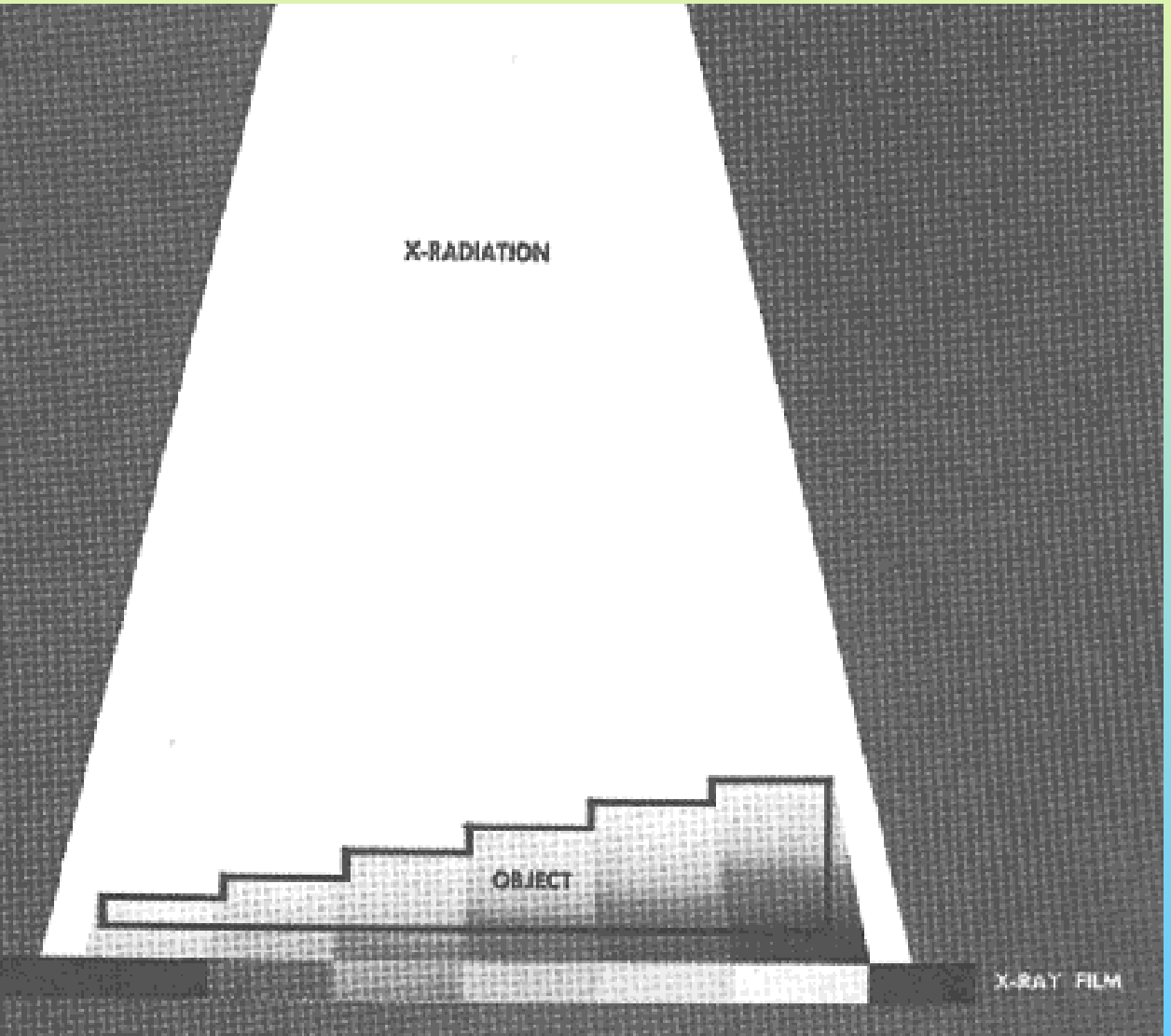
Radiodensity as a function of composition, with thickness kept constant.



a = air
b = tissue
c = bone
d = metal


AIR
SOFT
TISSUE
FAT
BONE

Radiology as a function of thickness

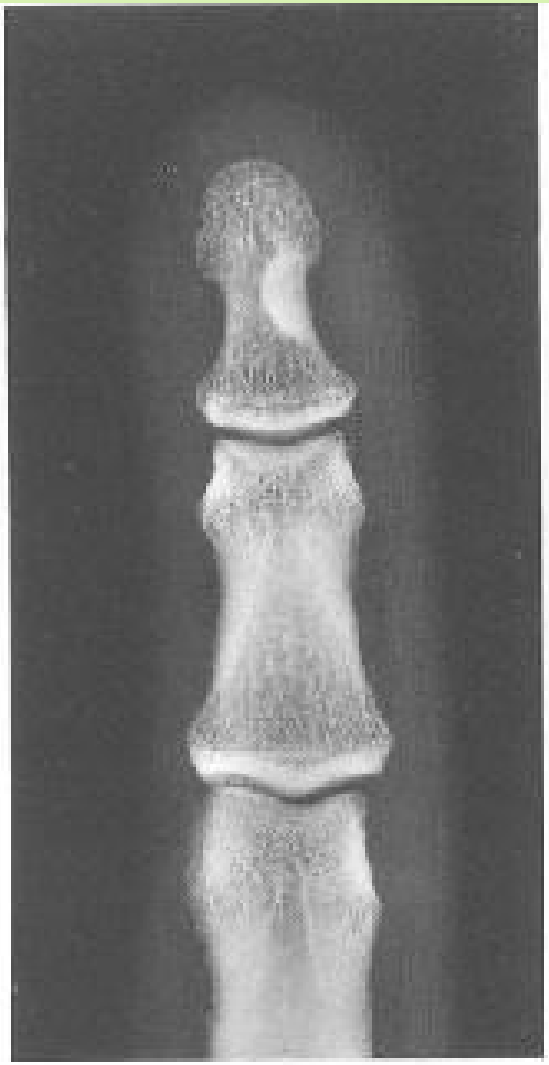


The thicker the object, the denser the shadow.

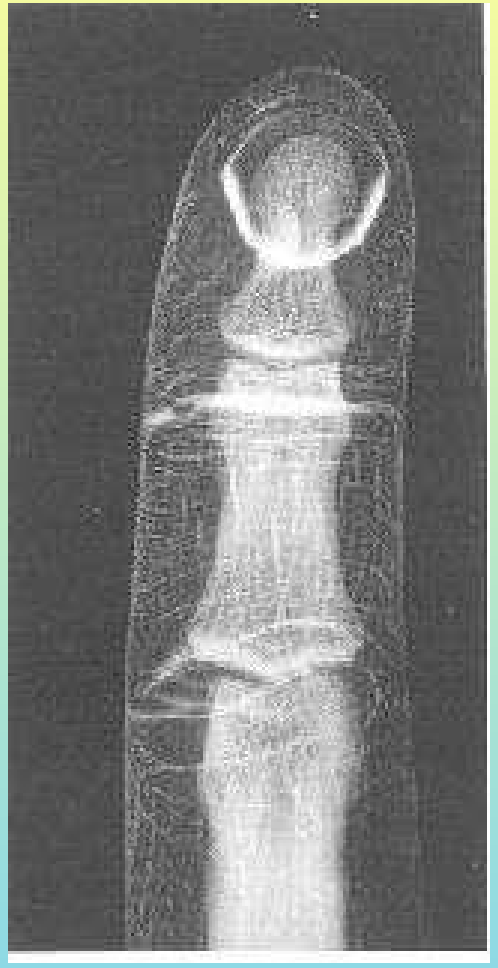
The added thickness of the breast tissue leaves visible shadows on the x-ray

Thinking Three-Dimensionally

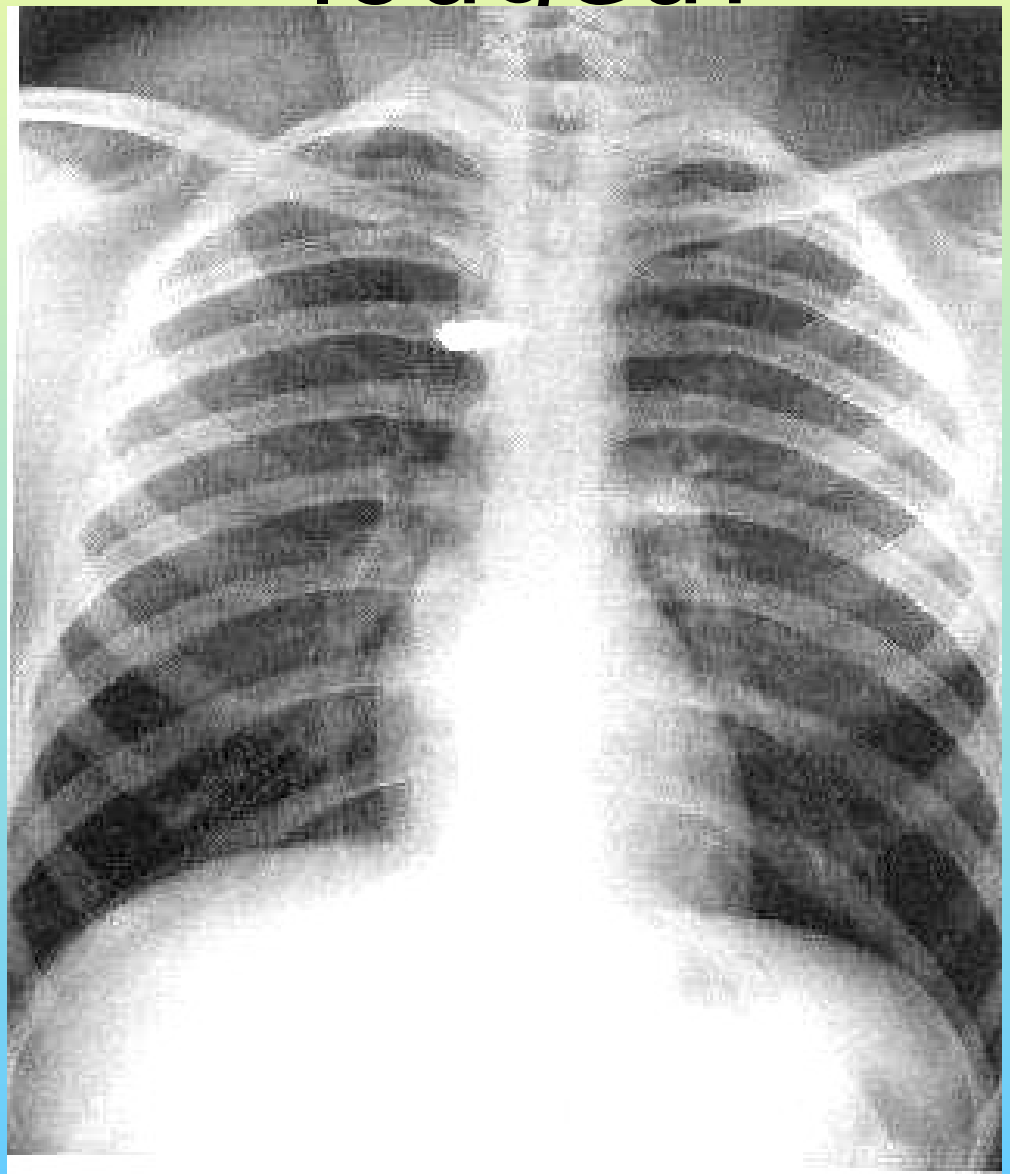
This radiograph looks flat and it is difficult to remember that the finger is actually three dimensional.



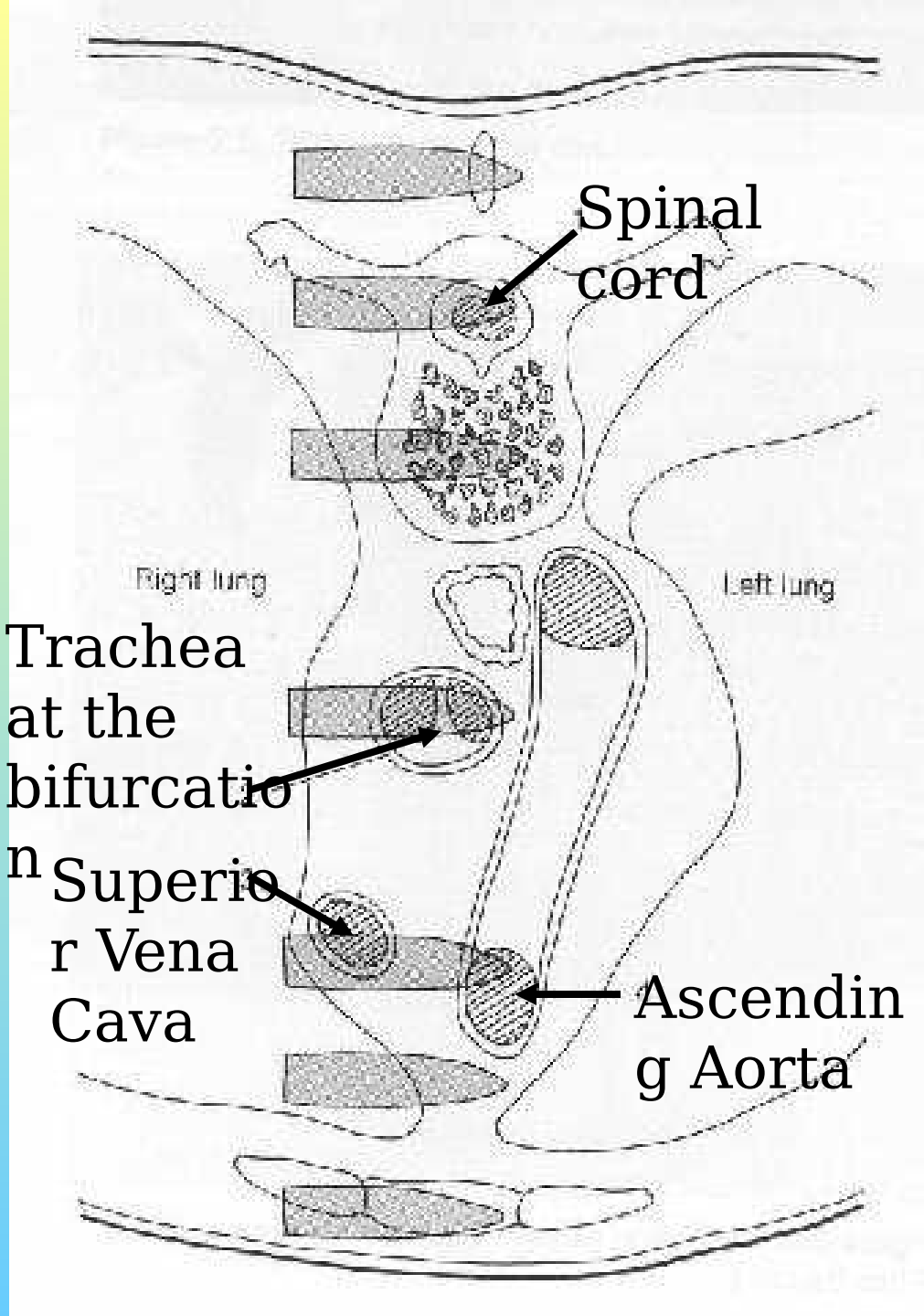
The addition of some radio-opaque powder helps to see the three dimensional quality of the film



Where is this bullet lodged?

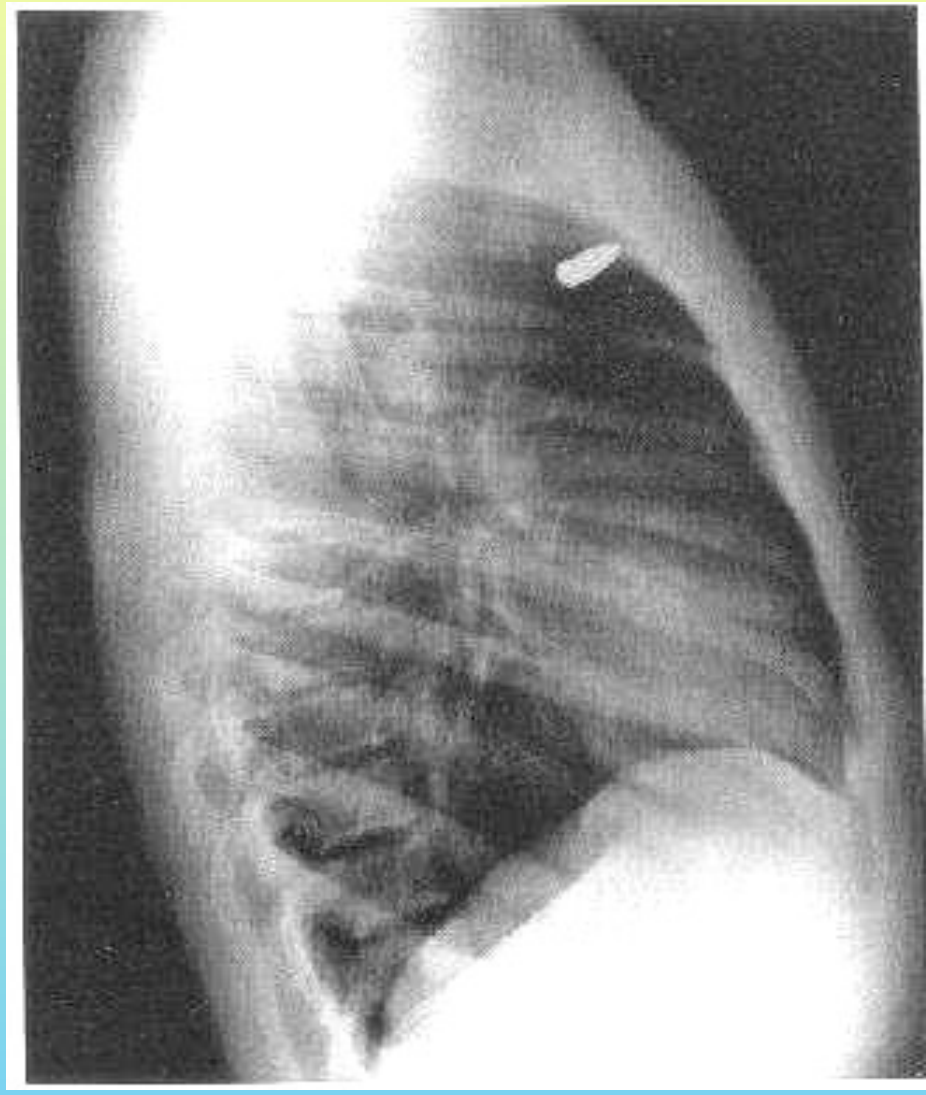


Looking from the head towards the feet (cephalo-caudal) with the spine towards the top of the picture – the bullet may be sitting at any level from front to back - as seen here.



By getting a lateral, a three dimensional view can be realized.

The bullet looks to be between the ascending aorta and the sternum.



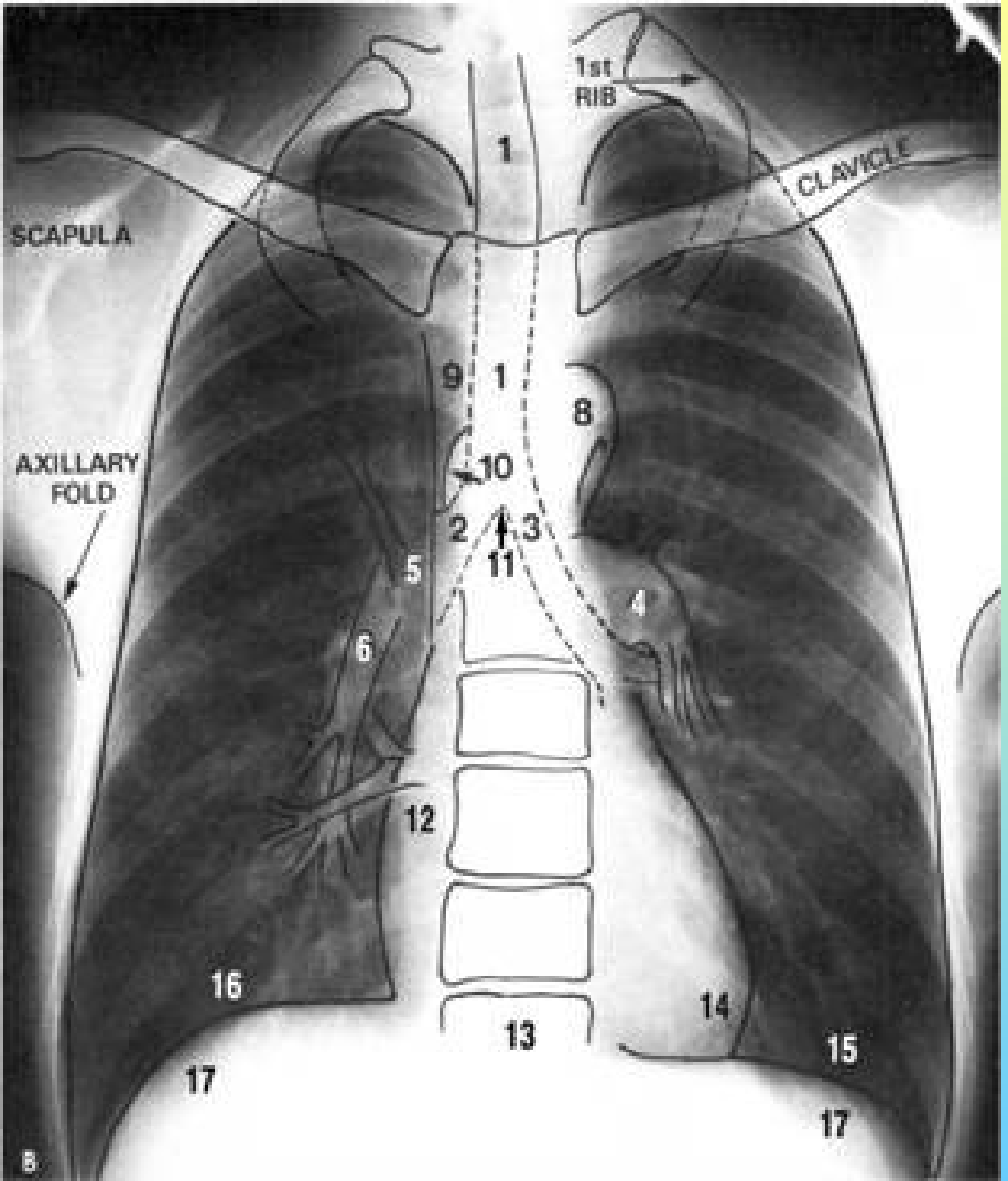
Normal Radiographic Anatomy

Knowledge of anatomy is mandatory!!!

How to ‘read’ an X-ray

- Systematic checklist for Chest X-rays.
- Systematic checklist for general X-rays
  .

- Top to bottom, left to right
- Bones, Soft tissue, empty spaces
- Bones, lungs, mediastinum, extra thoracic spaces.

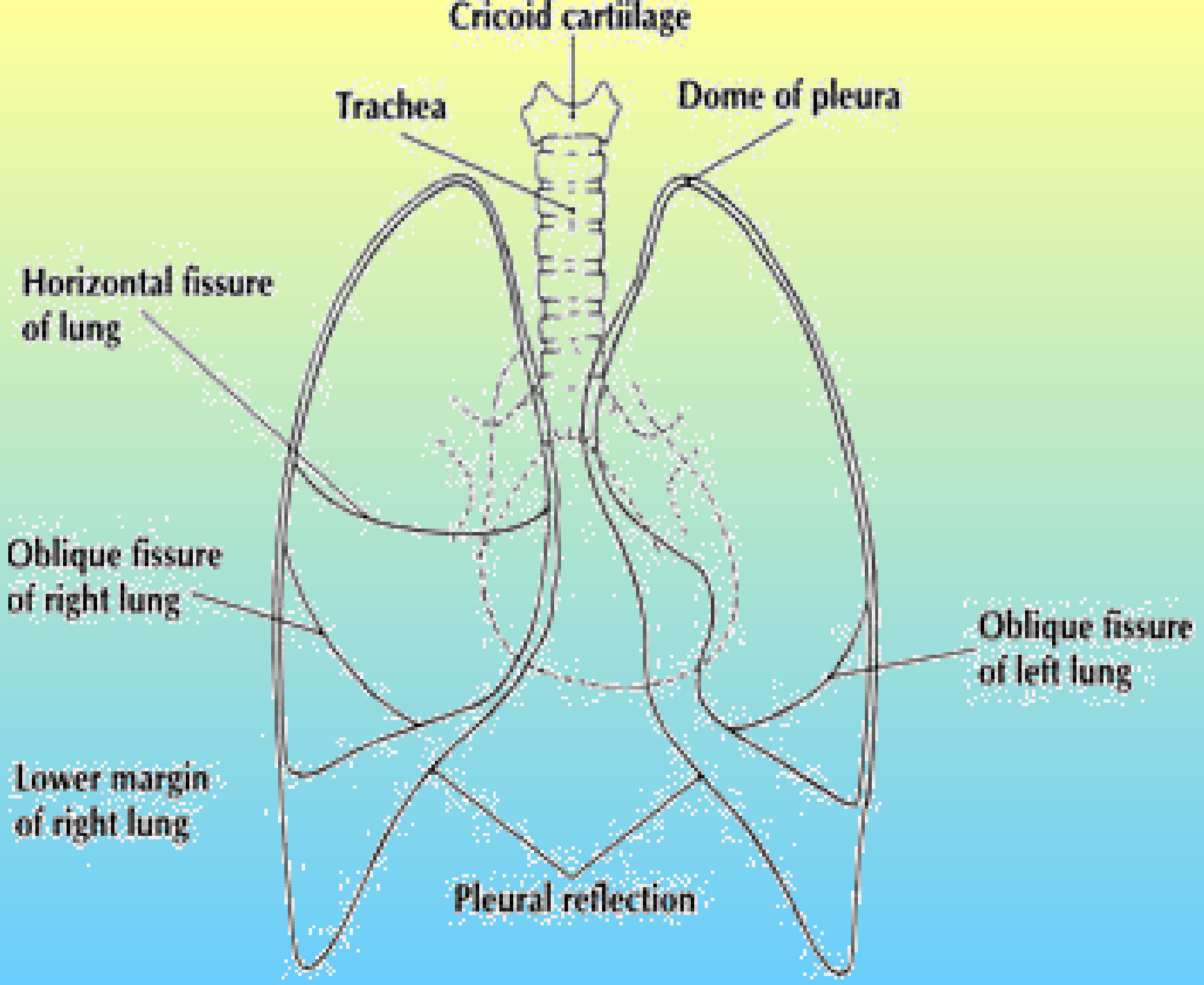


1. Trachea
2. Right Mainstem
3. Left Mainstem
4. Left Pulmonary Artery
5. Right upper lobe pulmonary vein
6. Right Interlobar artery
7. Not labeled
8. Aortic knob
9. Superior vena cava
10. Ascending aorta
11. Carina
12. Right atrium
13. Right ventricle
14. Left ventricle
15. Left Hemidiaphragm
16. Right Hemidiaphragm

L

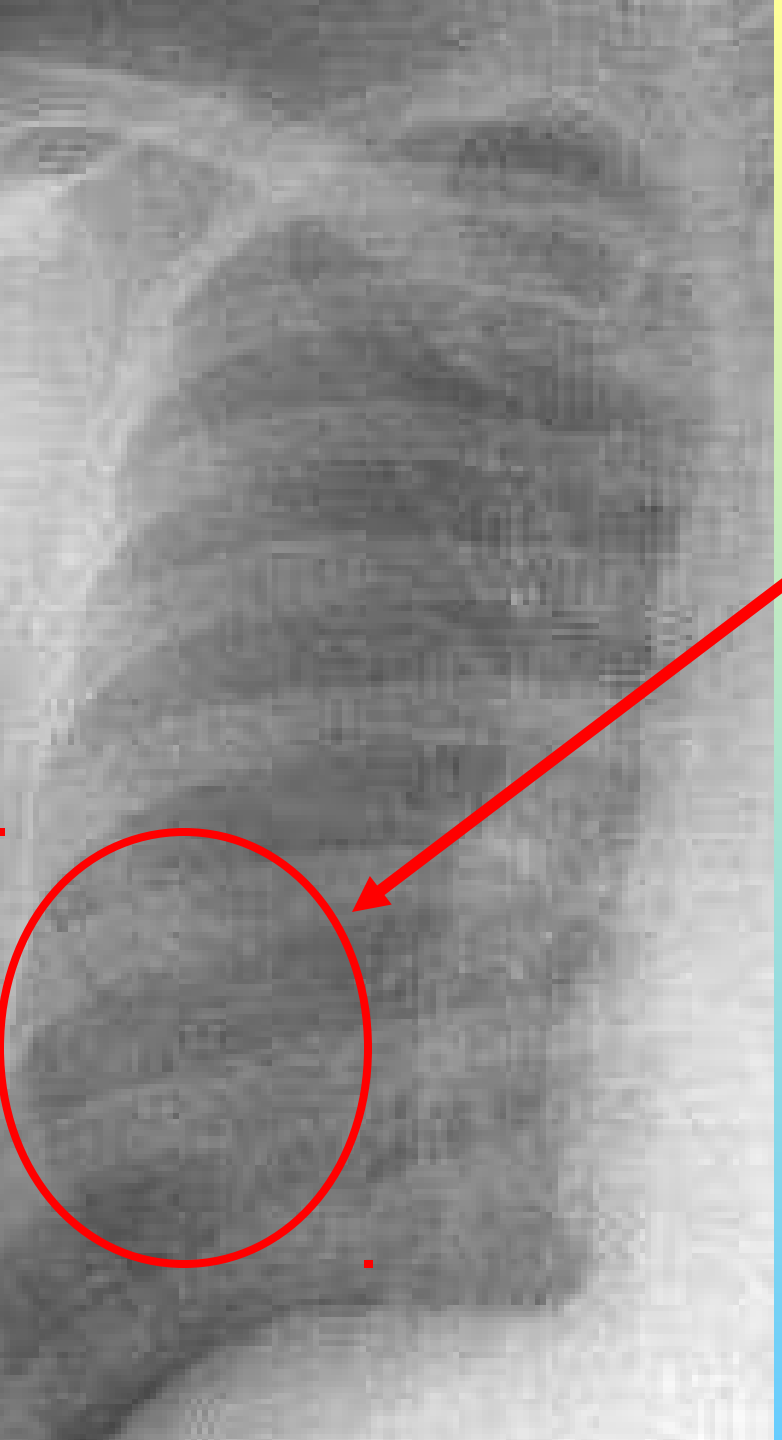
Lung

- The left lung has two lobes, the right has three.
- Most of the inferior lobes are far lateral and posterior to the diaphragm.
- The apices of the lungs extend above the clavicle and second rib.

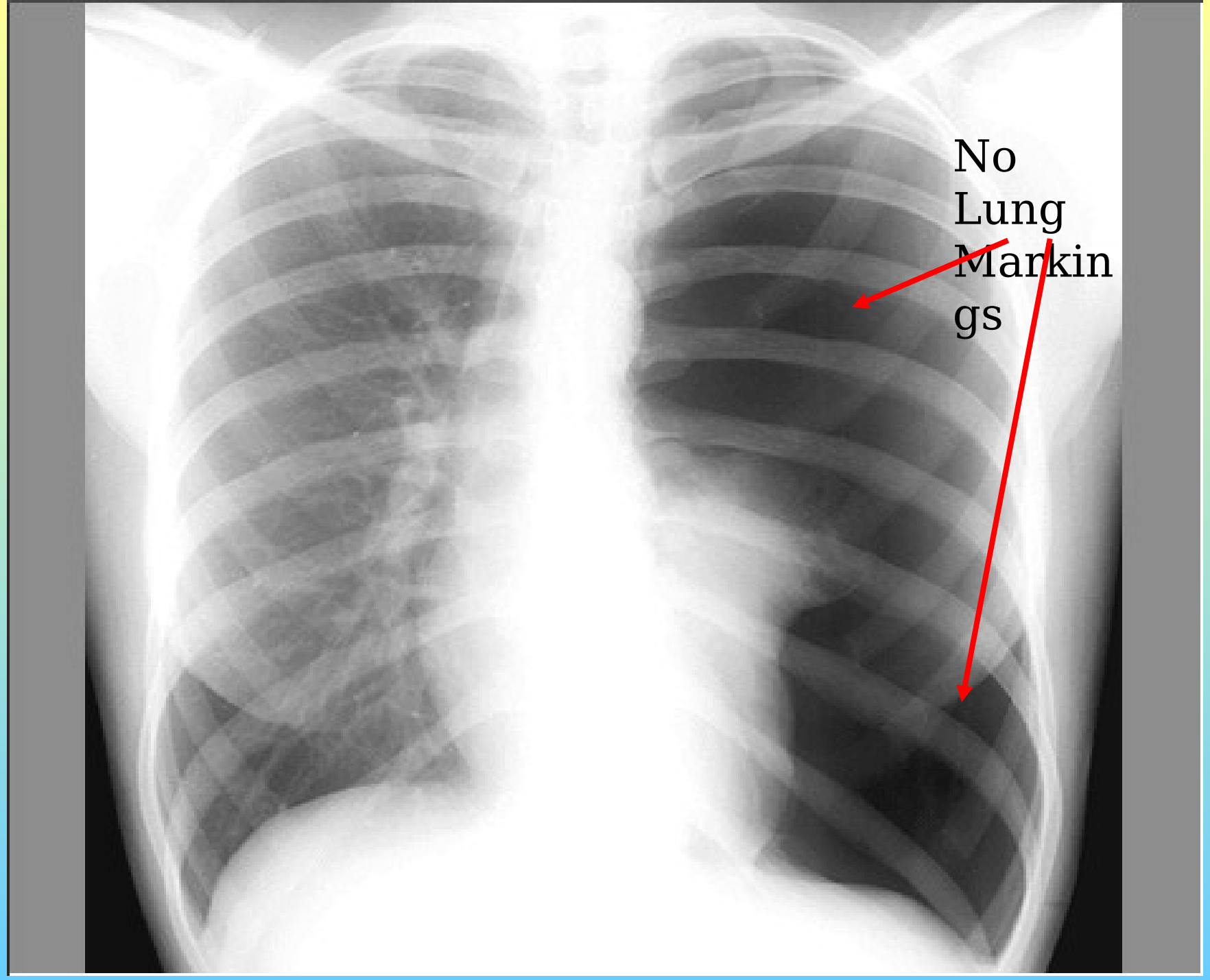

Cricoid cartilage
Trachea
Dome of pleura
Horizontal fissure of lung
Oblique fissure of right lung
Oblique fissure of left lung
Lower margin of right lung
Pleural reflection

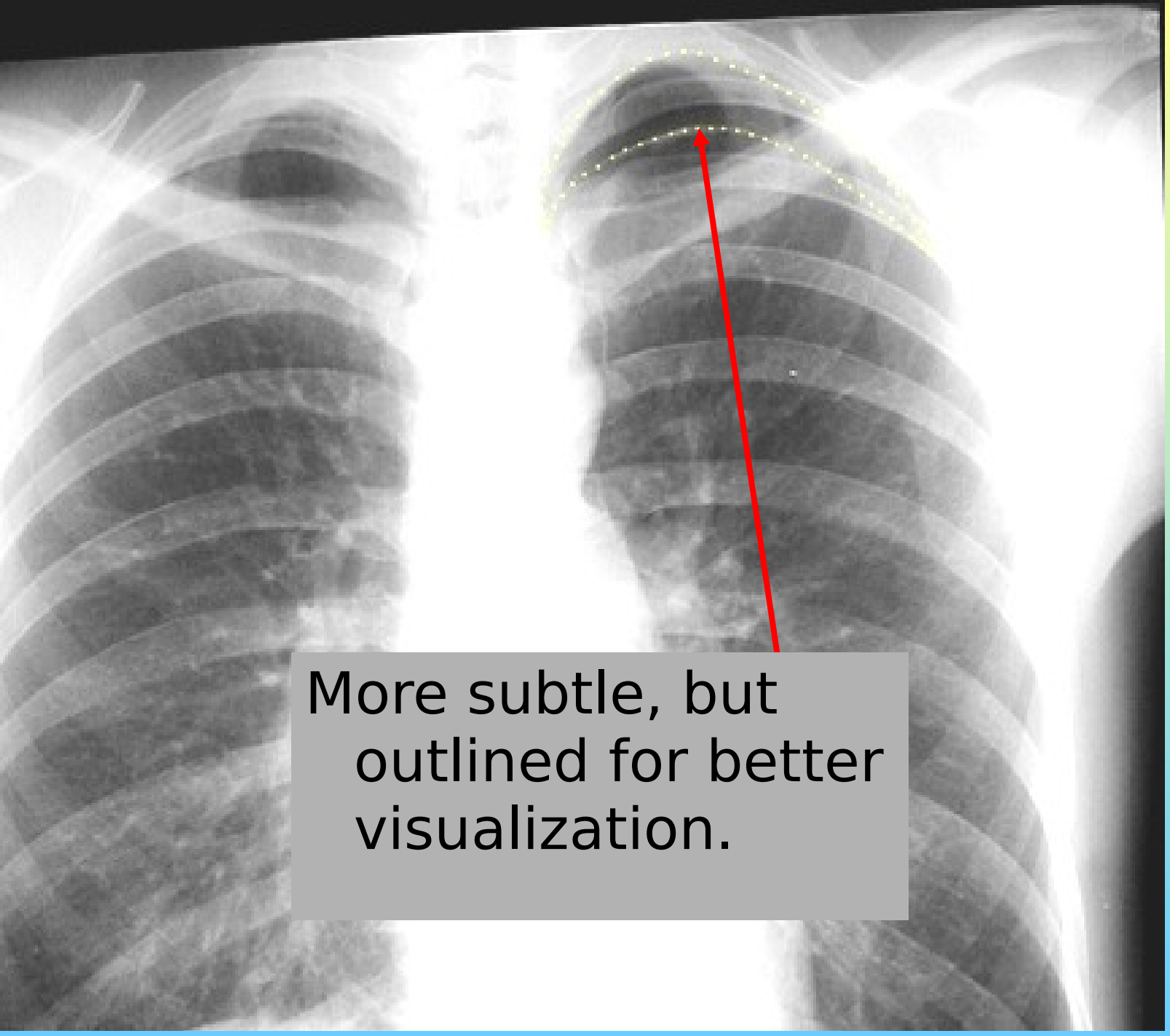
Lung Markings

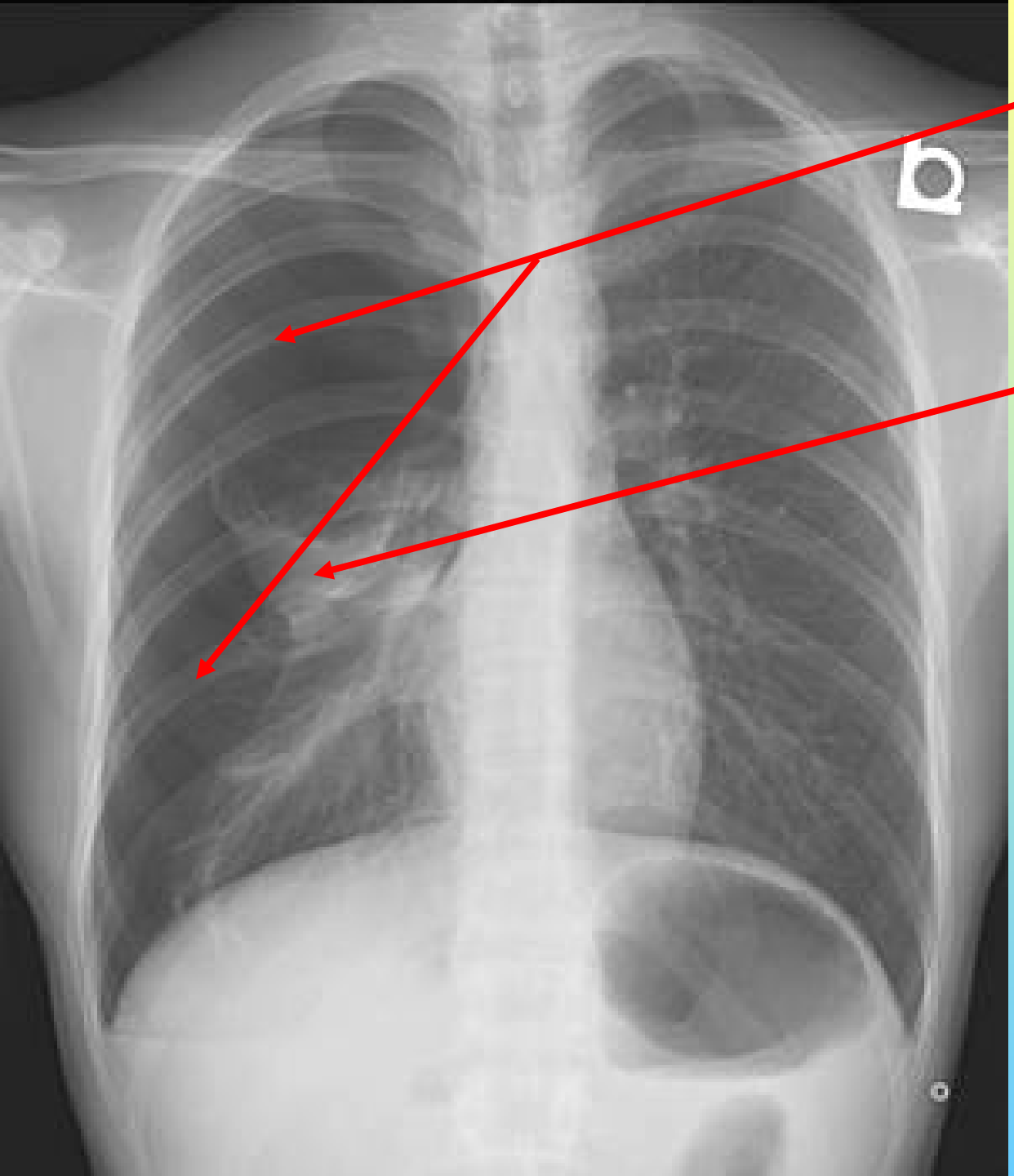
- Bronchioles and alveoli, along with arterioles and veinules show markings that should extend to the peripherial margins of the thoracic cavity.



- All the way to the lung borders


No
Lung
Markin
gs

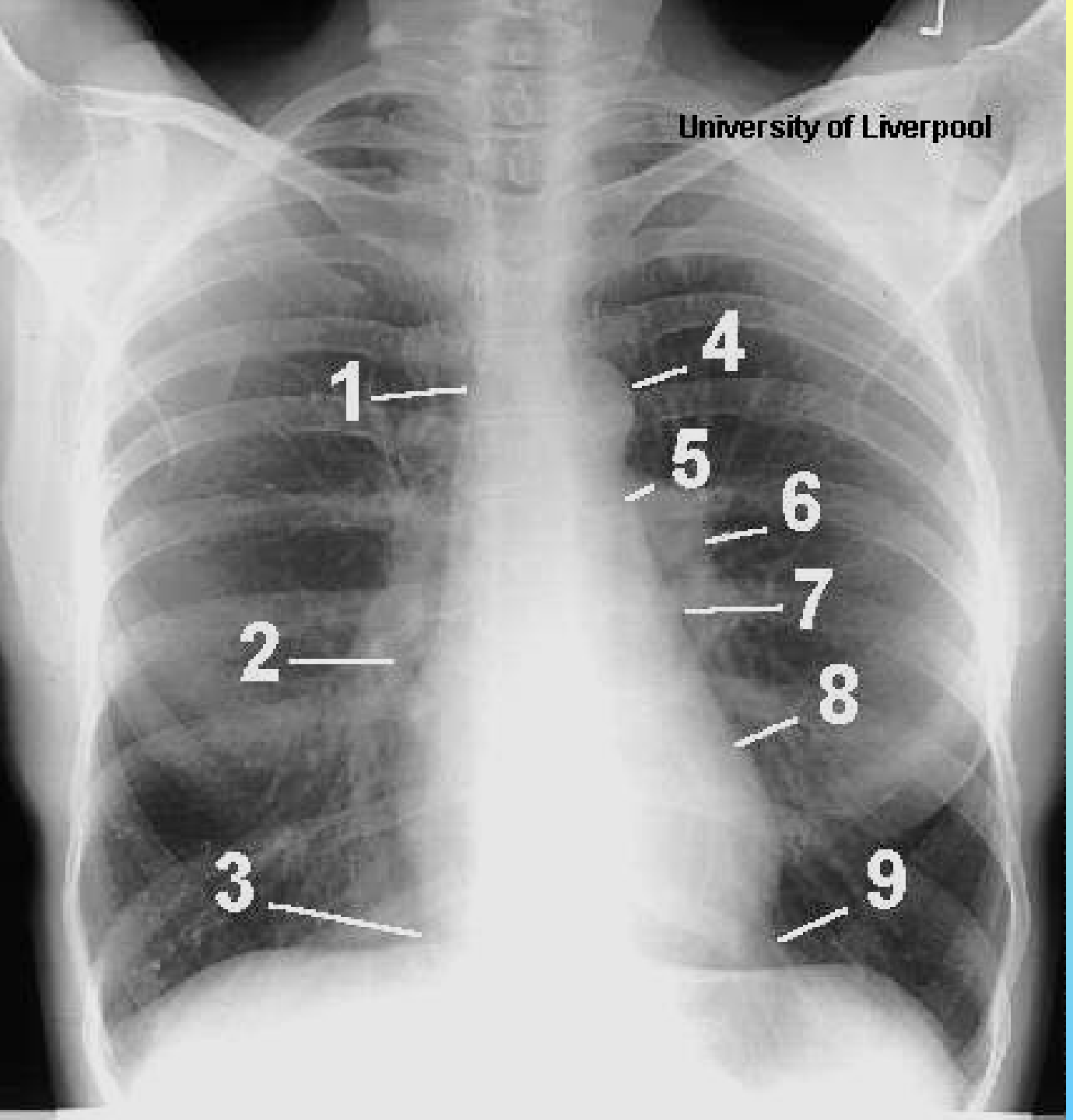

More subtle, but
outlined for better
visualization.



- No lung markings
- Collapse d lung tissue

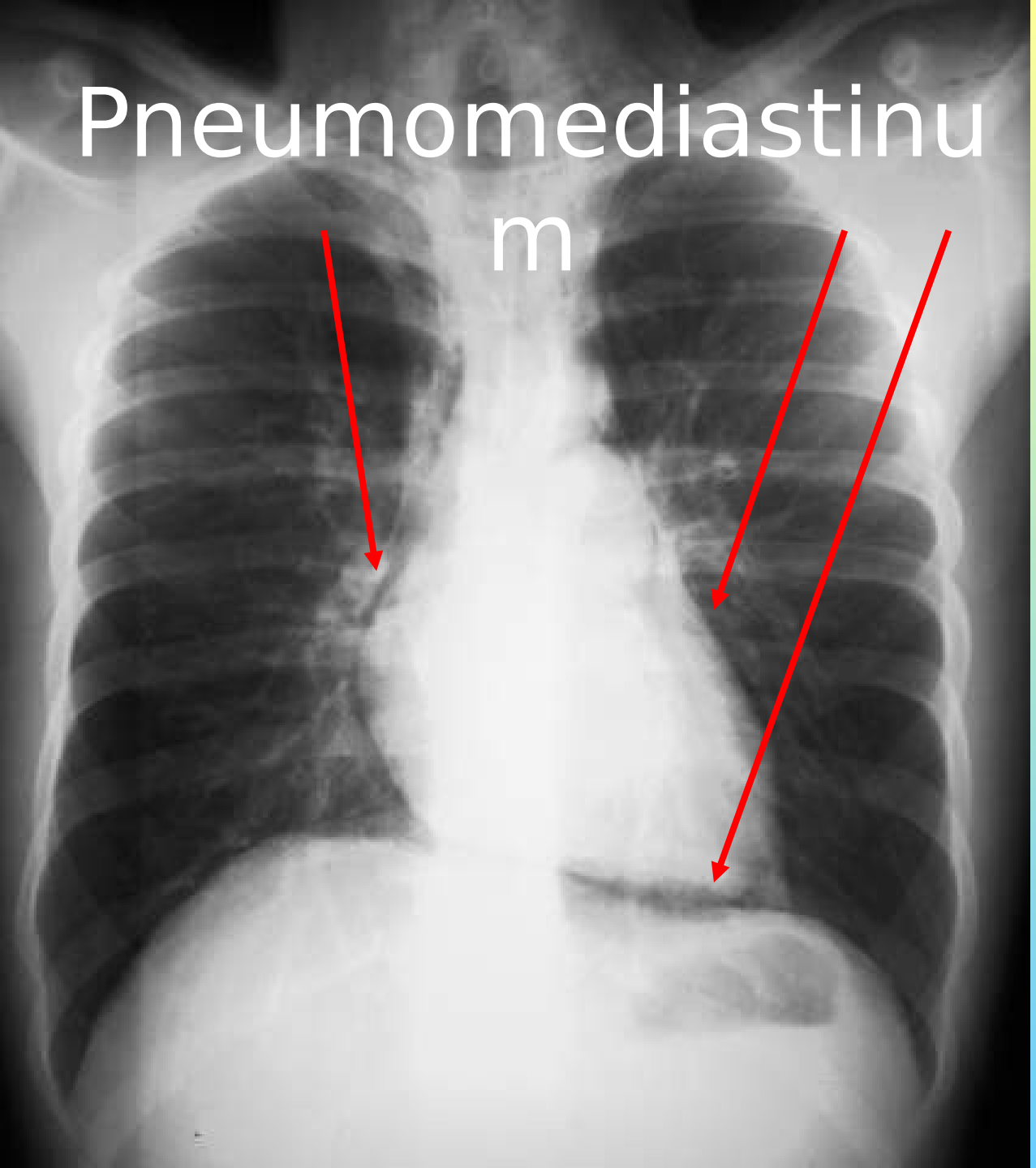
Mediastinum

- Consists of heart, great vessels and lymph tissues.



1. Sup. Vena Cava
2. Rt. Atrium
3. Inf. Vena Cava
4. Aortic Arch
5. Lt. Pulmonary Trunk
6. Lt. Pulmonary Artery
7. Tip of auricle of lt atrium
8. Lt ventricle
9. Lt cardiophrenic angle

Pneumomediastinum



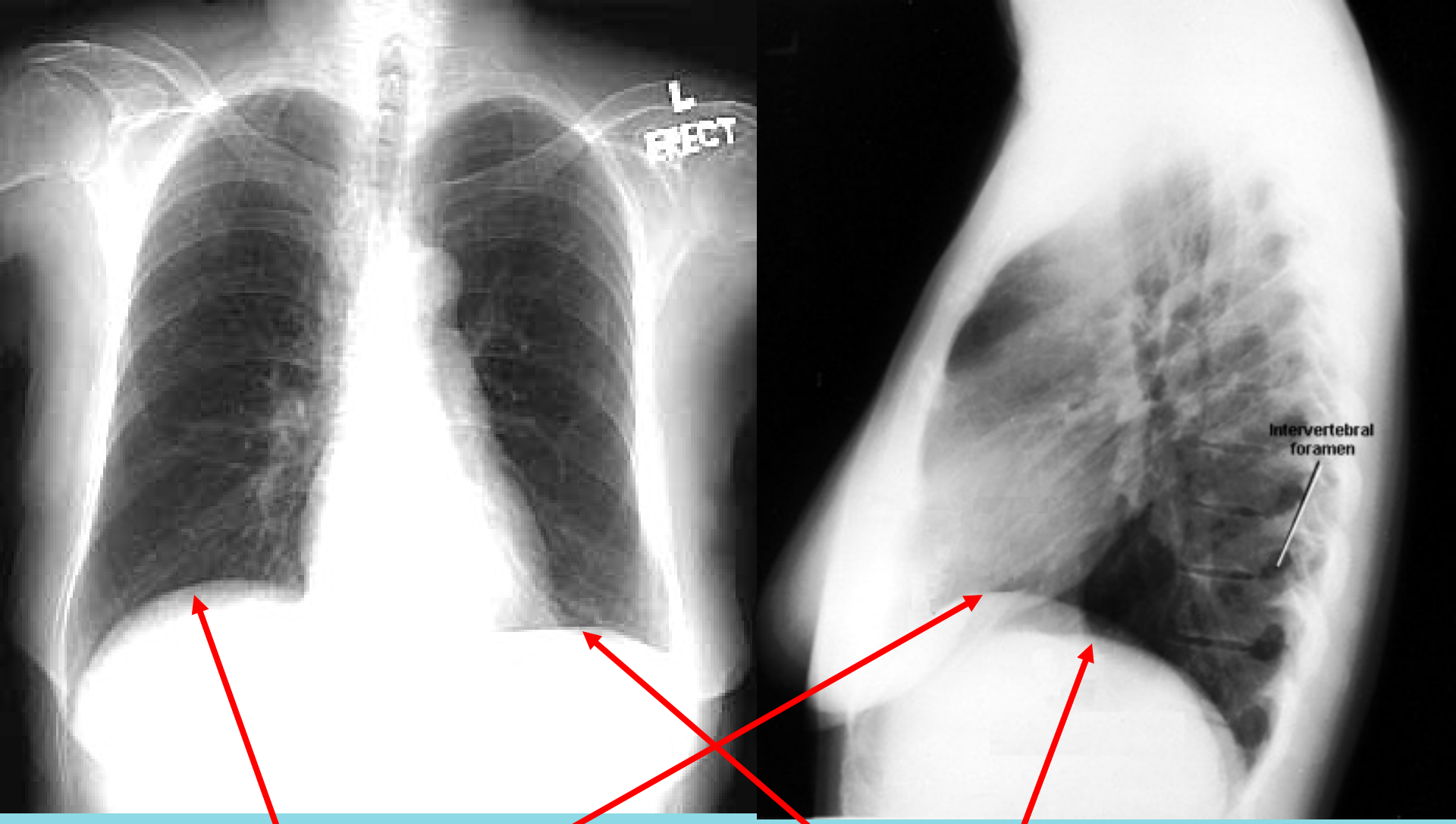
- Air in the mediastinum

Widened Mediastinum

- Hallmark of Anthrax infection
- May also follow trauma to the chest (blood in the mediastinum)

Diaphragm

- Separates the chest from the abdomen.
- Normally the right hemidiaphragm is higher than the left (important on the lateral views).



Right hemidiaphragm

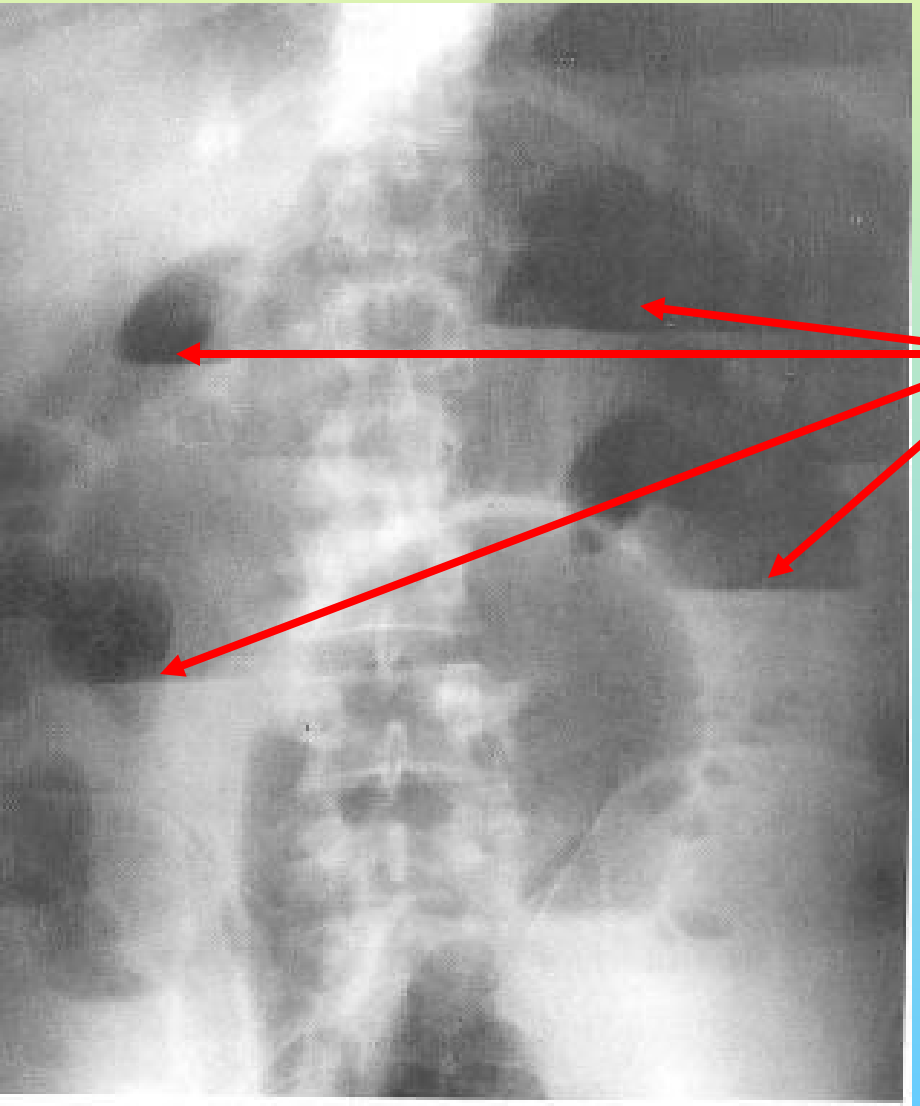
Left hemidiapragm

Abdominal X-ray

- Soft tissues are harder to image than bones and air.
- Composition is a mixture of fluid filled tissue, empty space and tissue walls.

- Single arrow is the tip of the spleen.
- Double arrows are the liver edge
- Tripple arrows are the edge of the psoas muscle (psoas sign)
- ‘Ground glass’ appearance is air and stool in the small and large intestines.

Bowel Gas Patterns, Free Fluid and Free Air

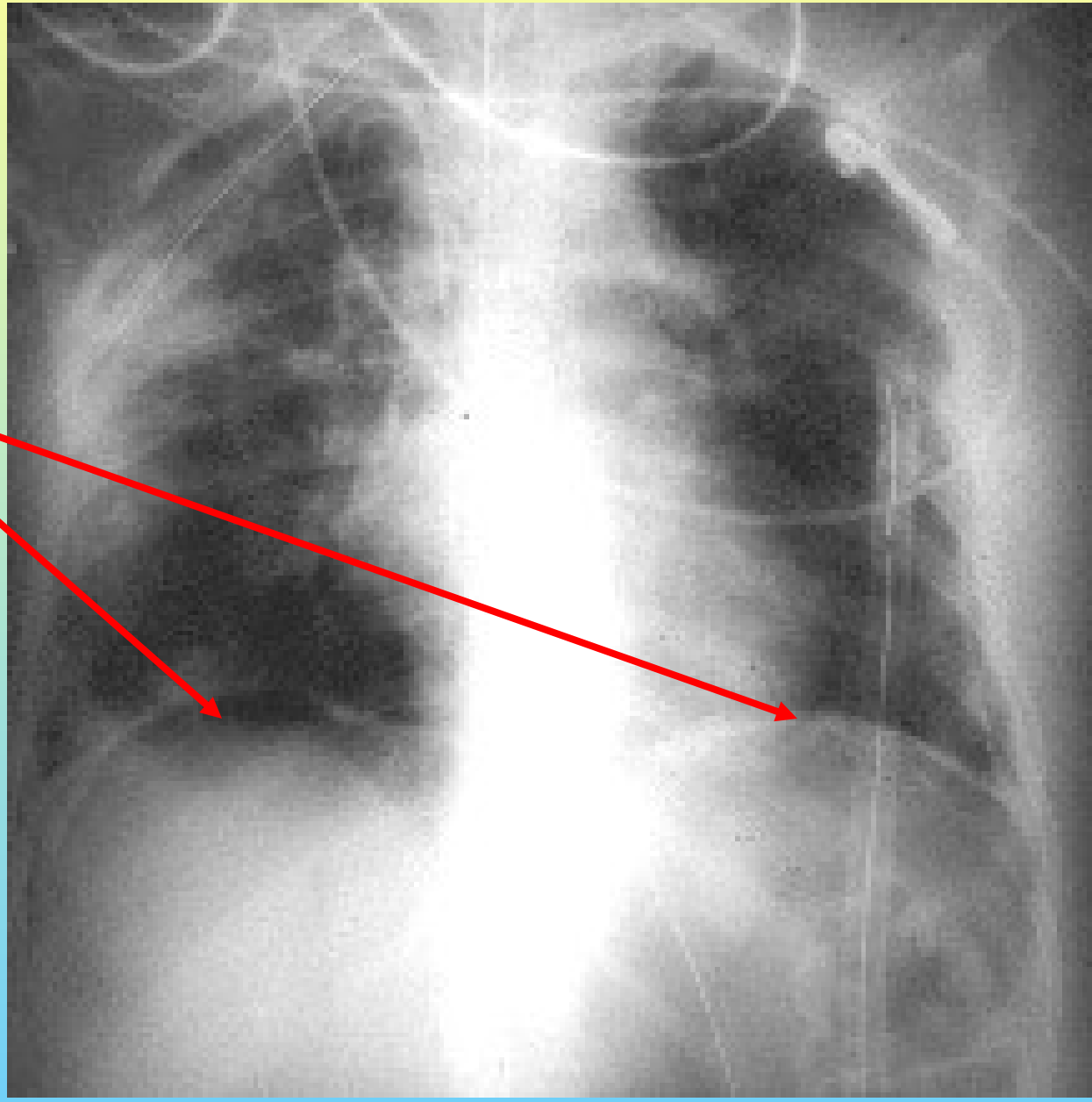


- This x-ray shows air-fluid levels in the small bowel.

Pneumoperitoneum

- Air in the peritoneal cavity (usually from a perforated bowel). (This is not a stomach bubble!!).

- Lucency under the diaphragm



Pelvic Cavity

2
1
7
10
11
4
5
6
3
2
13

Musculo-skeletal system

Use the X-ray to visualize the bone

Trebeculae and stress lines

These lines represent remodeling along the lines of greatest stress on the bone.

Description of a Fracture

1. Angulation (measure it)
2. Displacement (measure it – and describe what direction). The distal fragment is the one that is displaced or angulated.
3. Describe the fracture
4. Name the bone(s) involved

Ex: 15^{o} angulated, 1 cm laterally displaced transverse fracture of the femur.

Pretty Easy

- Non-angulated, minimally displaced spiral vs transverse fracture of the 3rd Rt Metatarsal.

Again, too easy!

- Non angulated, ½ cm laterally displaced transverse fracture of the distal tibia (look for fx of the fibula, derangement of the knee or ankle as well)

more complicated

5^{o}-10^{o} angulated, minimally displaced, comminuted fracture of the humerus with 4 or 5 fragments.

A little tough to see

Better here –

Non-angulated, non-displaced radial head fracture (concerning because it goes through the articular surface)

Always get more than one view!!

Skull

Normal Anatomy

- Is this a fracture?

Let’s look closer

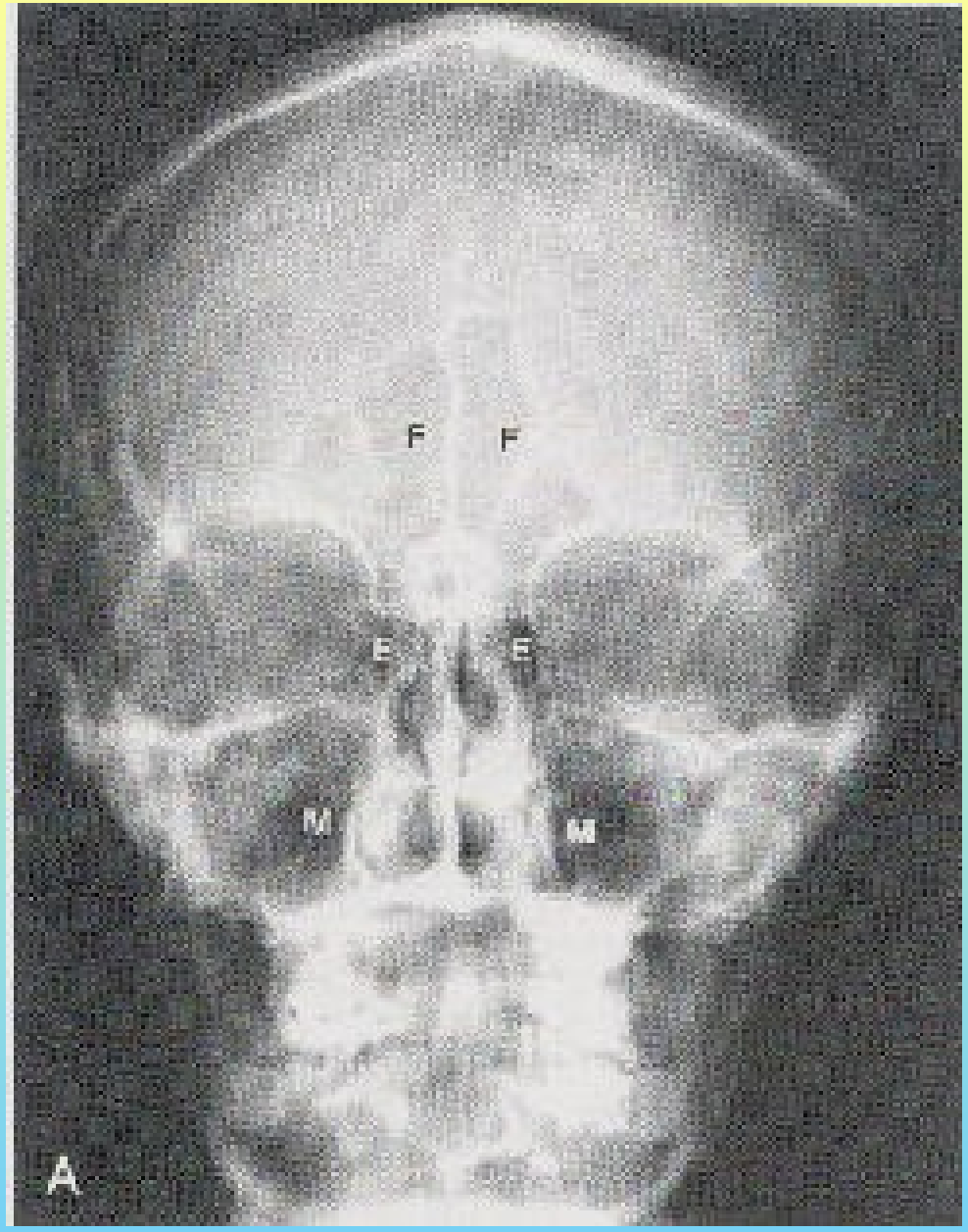
Actually it is a suture line between the skull bones.

Sinuses

F = frontal

E = Ethmoid

M = Maxillary



- Sinuses from another view (Waters View)
- Note the fluid level in the left maxillary

Even with the bad photography, you should be able to see the opacified (full) right maxillary sinus. This is past a fluid level.

End